

Changes of taxonomy in giant stick-insects.

Paul D. Brock, "Papillon", 40 Thorndike Road, Slough, SL2 1SR, UK.

Abstract

The genus *Tirachoidea* Brunner von Wattenwyl is confirmed as a synonym of *Pharnacia* Stål, having been listed as a separate genus from 1893-1908 and since 1923. Listings of species are given, following the transfer of several species formerly in the genus *Pharnacia*, mainly to the genus *Phobaeticus* Brunner von Wattenwyl; for which for type species of *Phobaeticus sobrinus* has been selected. As a result of these significant taxonomic changes, affecting some of the longest species in the world, an amendment to keys to tribes of the subfamily Phasmatinae is proposed.

Key words

Phasmida, *Pharnacia*, *Tirachoidea*, *Phobaeticus*, Taxonomy.

Introduction

I originally received dead specimens and eggs of a species from Marinduque Island, Philippines via Mr Helmut Probst (Germany) in 1990, which I identified as *Pharnacia ponderosa* Stål, the type species of the genus *Pharnacia* Stål. It was apparent that these closely matched the adult morphology and egg structure of *Tirachoidea cantori* (Westwood, 1859) and, following research on a number of related species, by checking type material at several Museums, in addition to making a full review of the literature, I am now proposing a restructure of these genera by:

- i) confirming Redtenbacher's treatment (1908) of *Tirachoidea* Brunner von Wattenwyl, i.e. listing it as a synonym of *Pharnacia* (but for a different reason).
 - ii) transferring several *Pharnacia* species to the genus *Phobaeticus* Brunner von Wattenwyl, for which the type species *Phobaeticus sobrinus* Brunner von Wattenwyl, 1907 is designated in this work (along with a lectotype). As a result of this change, the genus *Phobaeticus* now includes species with winged or wingless males; females are always wingless.
 - iii) transferring *Phobaeticus sumatranus* Brunner von Wattenwyl to *Pharnacia*, due to an error in its original placement.
 - iv) amending keys dealing with tribes of the subfamily Phasmatinae.
- The changes are as used in my book on Malaysian phasmids (in press).

Discussion on the genera *Pharnacia*, *Tirachoidea* and *Phobaeticus*

Following Brunner von Wattenwyl's splitting of the genus *Pharnacia* in 1893, when he transferred four species to his new genus *Tirachoidea*, authors have treated the genera as separate until publication of Brunner von Wattenwyl & Redtenbacher's monograph (1906-1908). The final section, published by Redtenbacher (1908), listed *Tirachoidea* as a synonym of *Pharnacia*, presumably because Redtenbacher considered that they belonged to the same genus. His key separates the first four more robust species (in the female) which includes the type species of *Tirachoidea*: *T. cantori* (Westwood), from much more elongate species (in the female). In his critical assessment of the monograph, Karny (1923: 240) returned the first four species mentioned by Redtenbacher to *Tirachoidea*, where they have remained until now.

Whilst I confirm Redtenbacher's synonymy, the reasoning is different. *Tirachoidea* is a synonym of *Pharnacia* on the basis that *T. cantori* belongs to the same genus as *Pharnacia ponderosa* Stål, the type species of *Pharnacia*. Redtenbacher's key to species listed *ponderosa* as "species uncertain", possibly because he had not examined the species; however, Karny was correct in splitting up Redtenbacher's treatment of *Pharnacia*, as they differ in adult morphology and egg structure, although he did not identify the link between *cantori* and *ponderosa*. The elongate species formerly in the genus *Pharnacia* are transferred

to *Phobaeticus*.

Phobaeticus is currently separated from *Pharnacia* because males are wingless in *Phobaeticus*, but winged in *Pharnacia*. Hence, where only females of *Phobaeticus* were described by Brunner von Wattenwyl, once males were traced, they could be transferred to *Pharnacia* (if winged) e.g. Bragg (1995) transferred the largest species in the world *Phobaeticus kirbyi* Brunner von Wattenwyl on this basis.

The tribes of the subfamily Phasmatinae

Phobaeticus previously belonged to the tribe Baculini and *Pharnacia* (and its synonym *Tirachoidea*) to the tribe Pharnaciini, with the distinction between the two tribes relating to whether both sexes are completely wingless (Baculini), or winged in the male only (Pharnaciini). *Phobaeticus* should now be included in the Pharnaciini and marked as an exception to the current division i.e. it now includes males which are winged or wingless. A key to distinguish *Pharnacia* and *Phobaeticus* is given below:

1. Back of head rounded or elevated; often with two swollen tubercles. Males with large hind wings, all legs very spiny. Females of robust appearance with broadened thorax, males slender. *Pharnacia*
- Back of head neither raised or swollen. Hind wings in male either absent, large or reduced. Femora very serrate, particularly fore femora. Both sexes very elongate, female not robust. *Phobaeticus*

Check-list of species

The listings are in alphabetical order within each genus, where I consider that the species are valid, although information on type specimens may be incomplete i.e. data may be fuller once all type material has been examined. The listings do not include all references to species made in the literature, only significant areas, including synonyms which are listed beneath each species, with relevant comments where necessary. The following changes to generic placement were not included in my Catalogue of Malaysian species (1996), as I was not able to check type material in MCSN and ANSP until the second half of 1995.

Museums and collections in which type material is located are abbreviated as follows. The abbreviations follow those of Arnett *et al.* (1993):

ANSP	Academy of Natural Sciences, Philadelphia, U.S.A.
BMNH	The Natural History Museum, London, England.
HNHM	Hungarian Natural History Museum, Budapest, Hungary.
ISNB	Institut Royal des Sciences Naturelles de Belgique, Brussels, Belgium.
MCSN	Museo Civico di Storia Naturale "Giacomo Doria", Genoa, Italy.
MHNG	Museum d'Histoire Naturelle, Geneva, Switzerland.
MNHN	Museum National d'Histoire Naturelle, Paris, France.
NHMB	Naturhistorisches Museum, Basel, Switzerland.
NHMW	Naturhistorisches Museum Wien, Wien (Vienna), Austria.
NHRS	Naturhistoriska Riksmuseet, Stockholm, Sweden.
NZSI	National Zoological Survey of India, Calcutta, India.
OXUM	University Museum, Oxford, England.
SMNS	Staatliches Museum für Naturkunde, Stuttgart, Germany.
ZMAS	Zoological Museum, Academy of Science, St. Petersburg, Russia.
ZMHB	Museum für Naturkunde der Humboldt Universität zu Berlin, Berlin, Germany.
ZMUH	Zoologisches Institut und Zoologisches Museum, Universität Hamburg, Hamburg, Germany.

***Pharnacia* Stål, 1877**

Pharnacia Stål, 1877: 40. Type species: *Pharnacia ponderosa* Stål, 1877. (Designated by Kirby, 1904: 359, if there was any doubt concerning Stål's intentions). It may be considered that Stål, by listing *ponderosa* as No.1 for his new genus, intended it to be the type. However, this is not clear, as he also linked his new genus with his *Phryganistria* Div.a (1875: 63), which included one species *Phryganistria acanthopus* (Burmeister) described as *Bacteria acanthopus* by Burmeister, 1838: 565, but now considered a synonym of *Phobaeticus serratipes* (Gray).

Tirachoidea Brunner von Wattenwyl, 1893: 83. Synonymised by Redtenbacher, 1908: 449. Type species: *Tirachoidea cantori* (Westwood) [*Phibalosoma cantori* Westwood, 1859: 74, pl. 37.1 (♂) & 38.1 (♀)], designated by Rehn, 1904: 70.

***Pharnacia annamallayanum* (Wood-Mason)**

Phibalosoma annamallayanum Wood-Mason, 1877a: 161. Syntypes: 1♀, S. India, Annamallay forests, coll. R.C. Beddome (in alcohol, presumed NZSI); 1♀, India, Travancore Hills coll. F. Day (very mutilated. Presumed NZSI).

Phibalosoma annamallayanum Wood-Mason, 1877b: 346, pl. 3.3 (♀). [misspelling].

Pharnacia annamallayanum (Wood-Mason); Kirby, 1904: 359.

***Pharnacia biceps* Redtenbacher**

Pharnacia biceps Redtenbacher, 1908: 451. Syntypes: 1♀, India, Assam (SMNS); 1♂, 2♀♀ Vietnam (MNHN) [examined]; Java (MHNG; HNHM - lost in fire; ZMHB; NHMW, 861; ISNB ?; MNHN; ZMUH; ZMAS). Hennemann *et al.* (1995: 437) listed the Assam ♀ in SMNS as a holotype, in error.

Tirachoidea biceps (Redtenbacher); Karny, 1923: 240.

***Pharnacia cantori* (Westwood)**

Phibalosoma cantori Westwood, 1859: 74, pl. 37.1 (♂) & 38.1 (♀). Lectotype ♂, Malaysia ["Malacca"] (OXUM, 621) [examined]; ♀ paralectotype, Malaysia (OXUM, 621) [examined].

Tirachoidea cantori (Westwood); Brunner von Wattenwyl, 1893: 83.

Pharnacia cantori (Westwood); Redtenbacher, 1908: 480.

***Pharnacia ponderosa* Stål**

Pharnacia ponderosa Stål, 1877: 40; Brock, 1992: 60 (rearing note), 13, fig. 10.34 (egg). Syntypes: 2♂♂, Philippines (NHRS) 1♂ examined.

***Pharnacia sumatranus* (Brunner von Wattenwyl)**

Phobaeticus sumatranus Brunner von Wattenwyl, 1907: 184. Syntypes: 1♀, Sumatra (MHNG) examined; ♀ (number of specimens not known) Sumatra, Indraviri (NHMB).

***Pharnacia westwoodi* (Wood-Mason)**

Phibalosoma westwoodi Wood-Mason, 1875: 216. Syntypes: 1♀, India, Nazeerah, coll. Foster (presumed NZSI); 1♀, India, Samaguting in Assam, coll. J. Butler (presumed NZSI).

Tirachoidea westwoodi (Wood-Mason); Kirby, 1904: 359; Qi & Lui, 1992: 250 [description of ♂ from China].

Pharnacia westwoodi (Wood-Mason); Redtenbacher, 1908: 451.

***Phobaeticus* Brunner von Wattenwyl, 1907**

Phobaeticus Brunner von Wattenwyl, 1907: 194. Type species [here designated]:
Phobaeticus sobrinus Brunner von Wattenwyl, 1907.

***Phobaeticus annulatus* (Redtenbacher)**

Pharnacia annulata Redtenbacher, 1908: 451. Type(s) ♂, Borneo, Sampit (ZMHB).

***Phobaeticus beccarianus* Brunner von Wattenwyl**

Phobaeticus beccarianus Brunner von Wattenwyl, 1907: 185. Holotype ♀ (nymph):
Sumatra, Mt. Singalang, vii.1878, coll. O. Beccari (MCSN) [examined].

***Phobaeticus enganensis* (Redtenbacher)**

Pharnacia enganensis Redtenbacher, 1908: 451. Lectotype [here designated]: ♂, Is. Engano,
Bua Bua, v-vii.1891, coll. E. Modigliani (MCSN) [examined]; paralectotype ♂,
same data (MCSN) [examined].

***Phobaeticus fruhstorferi* Brunner von Wattenwyl**

Phobaeticus fruhstorferi Brunner von Wattenwyl, 1907: 184. Syntypes: 1♀, Burma, Mt.
Cariani, 1898, coll. D. Tornatore (MCSN) [examined]; 3♂♂, 1♀ (nymph), Vietnam,
coll. Fruhstorfer (NHMW, 307) [examined].

This species was listed by Günther (1935: 124) as a synonym of *Phobaeticus grandis* (Rehn), which requires confirmation by critical examination of type material. The length of the Burmese ♀ is not given by Brunner von Wattenwyl, who only provided a measurement of 185mm for the ♀ nymph in NHMW. The ♀ from Burma is, in any event, very unlikely to represent the same species.

***Phobaeticus grandis* (Rehn)**

Phryganistria grandis Rehn, 1906: 279. Holotype ♂, Vietnam ["Tonkin"] (ANSP)
[examined].

***Phobaeticus heros* (Redtenbacher)**

Pharnacia heros (Redtenbacher), 1908: 453. Syntypes: 1♀, Java, Tengger-Gebirge; 1♀, W.
Java, 1893, coll. Sukabami (ZMUH); ♀ (number of specimens not known) Sumatra
(coll. Mechel, present location unknown).

Whilst Weidner (1966: 231) listed the Tengger-Gebirge ♀ as holotype, and another ♀ as paratype, no holotype was selected by Redtenbacher and therefore it is likely that both specimens are syntypes.

***Phobaeticus hypharpax* (Westwood)**

Phibalosoma hypharpax Westwood, 1859: 75, pl. 13.6 (♂). Holotype ♂, Sri Lanka
["Ceylon"] (BMNH) [examined].

Tirachoides hypharpax (Westwood); Brunner von Wattenwyl, 1893: 83.

Pharnacia hypharpax (Westwood); Redtenbacher, 1908: 453.

***Phobaeticus incertus* Brunner von Wattenwyl**

Phobaeticus incertus Brunner von Wattenwyl, 1907: 185. Type(s) ♀, "Is. Banka (Mus
Berol)".

Brunner von Wattenwyl's comments and species name imply doubt concerning the placement of this species, which I have not examined.

***Phobaeticus ingens* (Redtenbacher)**

Pharnacia ingens Redtenbacher, 1908: 453. Syntypes: 1♀, India, Malabar, Meppadi (MHNG, not included in my unpublished listing, but possibly overlooked); 1♀, Burma, Upper Tennasserim, Moolai to Moolat, 4000-6000ft [specimen referred to *Phibalosoma acanthopus* Burmeister by Wood-Mason, 1877: 161] (believed to be in NZSI).

***Phobaeticus kirbyi* Brunner von Wattenwyl**

Phobaeticus kirbyi Brunner von Wattenwyl, 1907: 185. Holotype ♀: Borneo (BMNH) [examined].

Pharnacia kirbyi (Brunner von Wattenwyl); Bragg, 1995: 26.

Pharnacia serratipes; Kirby, 1896: 448 (not Gray, 1835); misidentification of ♀, on which Brunner von Wattenwyl based his description of *Phobaeticus kirbyi*.

Pharnacia maxima; Kirby, 1904: 359 [in part].

Pharnacia sagitta Redtenbacher, 1908: 454, pl. XXII: 2(♀) (synonymised by Bragg, 1995: 27)

Pharnacia pilicornis Redtenbacher, 1908: 455 (synonymised with *Pharnacia sagitta* by Günther, 1932: 315)

***Phobaeticus maximus* (Bates)**

Phibalosoma maximum Bates, 1865: 341. Holotype ♀, Sumatra (OXUM, 622) [examined].

Pharnacia maxima (Bates); Kirby, 1904: 359. [Kirby also listed, as a synonym, the ♀ *P. serratipes* he described 1896: 450 - misidentification, see *Phobaeticus kirbyi*].

Tirachoidea maxima Bates; Karny, 1923: 240.

This species is very similar to *P. serratipes* and possibly synonymous, but I have yet to examine males from Sumatra.

***Phobaeticus nigricornis* (Redtenbacher)**

Pharnacia nigricornis Redtenbacher, 1908: 452. Type(s) ♂, Borneo (HNHM, lost in fire).

***Phobaeticus pinnipes* (Redtenbacher)**

Pharnacia pinnipes Redtenbacher, 1908: 452. Type(s) ♂, Malaysia, Selangor (MNHN, not traced).

***Phobaeticus rigidus* (Redtenbacher)**

Pharnacia rigida Redtenbacher, 1908: 453. Type(s) ♀, Sumatra, Mt. Battak (NHMW, 862).

***Phobaeticus semilunaris* (Redtenbacher)**

Pharnacia semilunaris Redtenbacher, 1908: 452. Holotype ♀, Java (NHMW, 859) [examined].

***Phobaeticus serratipes* (Gray)**

Cladoxerus serratipes Gray, 1835: 42. Holotype ♂, "Malabar" (BMNH) [examined].

Phibalosoma serratipes (Gray); Westwood, 1859: 75.

Pharnacia serratipes (Gray); Kirby, 1904: 359.

Phasma (Bacteria) acanthopus Burmeister, 1838: 565; synonymised by Kirby, 1904: 359. [Not *Pharnacia serratipes*; Kirby, 1896: 450 - misidentification, subsequently described as *Phobaeticus kirbyi* Brunner von Wattenwyl].

***Phobaeticus sichuanensis* Cai & Liu**

Phobaeticus sichuanensis Cai & Liu, 1993: 469. Holotype ♀, China, Sichuan Province, Zhongxian, 9.x.1989, coll. Zeng Lin & Hu Liancheng (Nankai Univ.); paratypes: 3♂♂, 2♀♀, same locality (Nankai Univ.).

***Phobaeticus sinetyi* Brunner von Wattenwyl**

Phobaeticus sinetyi Brunner von Wattenwyl, 1907: 184. Syntypes ♂ & ♀, India, Sembaganor, Pulney Hills, Madras. (MNHN, Pantel collection; one ♂ in collection marked: Kodikanel, coll. P. Décoly) [examined]. Possibly also syntype(s) in NHMW (NHMW, 308).

***Phobaeticus sobrinus* Brunner von Wattenwyl**

Phobaeticus sobrinus Brunner von Wattenwyl, 1907: 184, pl. VII. 1a (♂), 1b (♀). Lectotype [here designated: ♂, Sumatra, Si-Rambé, xii.1890-iii.1891, coll. E. Modigliani (MCSN) [examined]; paralectotype ♀, Is. Nias, 1897-1898, coll. U. Raap (MCSN) [examined]

***Phobaeticus spectabilis* (Redtenbacher)**

Pharnacia spectabilis Redtenbacher, 1908: 453. Type(s) ♀, Sri Lanka ["Ceylon"] (NHMW, 863).

***Phobaeticus tirachus* (Westwood)**

Phibalosoma tirachus Westwood, 1859: 75, pl. 37.3(♂). Holotype ♂, Malaysia ["Malacca"] (OXUM) [examined].

Tirachoidea tirachus (Westwood); Brunner von Wattenwyl, 1893: 83.

Pharnacia tirachus (Westwood); Redtenbacher, 1908: 452.

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